Rural Renewable Applications

RENEWABLE ENERGY
THE INFINITE POWER OF TEXAS

HIGHLIGHTS

- **Agricultural producers have long been on the forefront of renewable energy use**
- **Rural locations are ideal for wind and photovoltaic power applications**
- **Agricultural waste and energy crops may become a new source of farm revenue**

SOURCE: CENTRAL & SOUTH WEST SERVICES

SOLAR POWERED WATER PUMP *West Texas ranchers inspect a PV powered water pump. These reliable systems are quickly gaining popularity throughout the state.*

INTRODUCTION

From the 200-foot tall windmills in Holland to those of west Texas, agricultural producers have long relied on renewable energy for their livelihoods. Whether the task was pumping water, drying crops or cooking, farmers have always relied on three things: the sun, the wind, and the rain. In fact, solar energy is the key that allows farmers to unlock the Earth's potential, whether it is the kinetic energy captured by the windmill or the photosynthetic energy captured by plants.

WATER PUMPING

Water pumping may be the most common use of renewable energy in agriculture. Three basic types of water pumps use renewable energy.

Mechanical Windmill Pumps

These simple devices have allowed farmers and ranchers to obtain the water they need for more than a century. Today, millions of farmers around the world rely on mechanical windmills for their water needs.

Photovoltaic-Powered Pumps

Submersible electric water pumps powered by photovoltaic (PV) modules are suitable for small to medium scale pumping needs up to about 2 horsepower depending on the depth of the water well. Given their simplicity, lack of moving parts and long life, these systems are growing in popularity.

SOURCE: JOHN HOFFNER

MECHANICAL WINDMILL *Used by generations of Texas ranchers, water pumping windmills continue to be placed in service for the benefit of thirsty livestock.*

Wind Turbine-Powered Pumps

A relatively new type of pump system, this method uses the electricity generated by a small wind turbine to directly power a submersible or centrifugal pump. U.S. Department of Agriculture tests here in Texas have compared this newer technology with mechanical windmills. While costing about the same as mechanical systems, the USDA found that the wind turbine systems produced almost twice the volume of water. Larger wind turbines can pump enough water for small-scale irrigation. Solar/wind hybrid pumping systems are also available.

ELECTRIC APPLICATIONS

With the cost of extending a power line as high as $30,000 a mile, reliable PV and wind power systems offer farmers and ranchers many uses they otherwise could not afford.

Electric Generation

PV systems are simple, reliable and require little maintenance. While relatively expensive at about $6,000 per kilowatt, PV systems costing as little as $50 can be a perfect fit for providing small amounts of power around the ranch. In rural areas where the wind is fierce, wind turbine systems costing about $2,500 per kilowatt are usually a better investment than PV, especially for applications needing a lot of energy. In some cases, large wind turbines may even provide electricity more cheaply than the local electric company.

Water Tank De-Icers

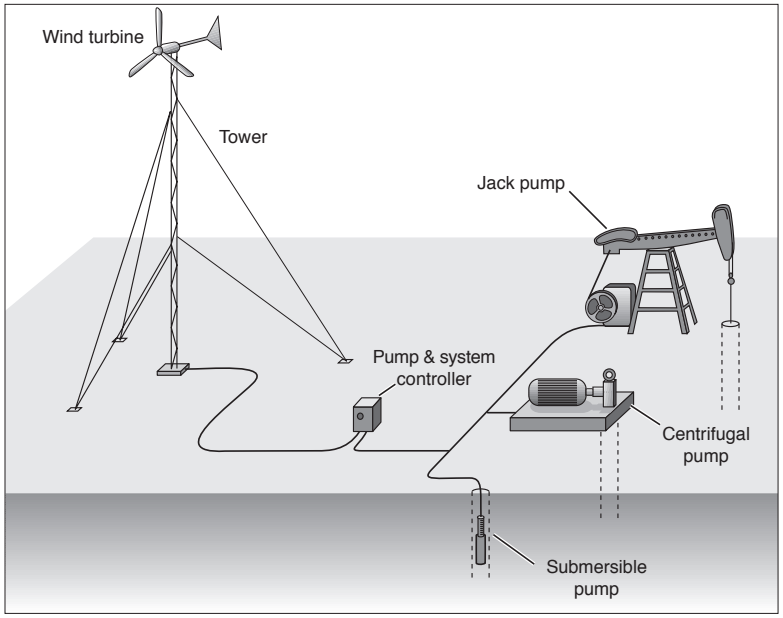
An essential technology for ranchers in cold climates, water tank de-icers are powered by a PV module that provides power to a small compressor that generates air bubbles on the bottom of the water tank. The movement of the water prevents ice from forming on the top of the tank. Performance of these units is best on tanks that are sheltered or insulated.

Electric Fences

Powered by PV modules, commercially available units can keep a fence electrified day and night. These units can deliver brief shocks with small pulses of low current at around 8,000 to 12,000 volts potential – more than enough to keep livestock contained.

Gate Openers

Gate openers are an ideal candidate for PV power because they are often located far from available power lines. Some models are brawny enough to open gates 16 feet wide and weighing up to 250



ELECTRIC-POWERED WATER PUMPING OPTIONS *Different types of electric water pumps, each suitable for different ranges of well depth and flow rate, can be driven directly by the wind turbine.*

pounds. These gate openers can utilize wireless remote control mechanisms or digital keypads, both of which offer convenience and security.

BIOMASS OPPORTUNITIES

Many farmers used to burn or plow under farm wastes. The advent of new technologies that convert biomass material from plants or animals into valuable energy may give farmers and ranchers moneymaking alternatives to such practices.

Agriculture Wastes

In many cases, troublesome waste products from agricultural cultivation and processing can be effectively used as a low cost fuel for making electricity or process heat. One cogeneration operation near Houston burns rice hulls from a local mill to make electricity that is sold to the local utility. Other candidates for agricultural waste feed stocks in Texas include cotton gin trash, sugarcane pulp, and peanut shells. Commercial development of small biomass gasification systems may soon assist this market. On dairies and large feedlots, manure can be processed to make electricity. Doing so reduces odor and potential pollution problems while adding a revenue source.

Farming Fuel: Biofuels & Energy Crops

While Texas refineries are among the nation's leading producers of ethanol-based automotive fuels, the ethanol feed stocks used in these blending operations come almost exclusively from grain produced in mid-western states. Texas farmers growing corn or grain sorghum would have another market for their products if local biofuel producers considered shopping locally. Over the next few years, markets may develop for the cultivation of dedicated energy crops such as switch grass, poplar trees or other fast-growing crops grown specifically for energy uses. Before long, growing our own fuel could become a reality in Texas.

SOURCE: CIELO WIND

ELECTRICITY GENERATING WIND TURBINE *Rural landowners now have opportunities to earn energy royalties by leasing their land to utility-scale wind farm developers.*

ORGANIZATIONS

American Solar Energy Society
2400 Central Ave., G-1
Boulder, CO 80301
(303) 443-3130
www.ases.org

American Wind Energy Association
122 C Street, N.W.
Washington, D.C. 20001
(202) 383-2505
www.awea.org

Renewable Fuels Association
One Massachusetts Ave., Suite 820
Washington, D.C. 20001
(202) 289-3835
www.ethanolrfa.org/

National Biodiesel Board
PO Box 104898
Jefferson City, MO 65110-4898
(800) 841-5849
www.eere.energy.gov/afdc/altfuel/biodiesel.html

National Renewable Energy Laboratory
1617 Cole Blvd.
Golden, CO 80401
(303) 275-3000
www.nrel.gov

Texas Solar Energy Society
P.O. Box 1447
Austin, TX 78767-1447
(800) 465-5049
e-mail: **info@txses.org**
www.txses.org

Texas Renewable Energy Industries Association
P.O. Box 16469
Austin, TX 78761
(512) 345-5446
www.treia.org

RESOURCES

FREE TEXAS RENEWABLE ENERGY INFORMATION
For more information on how you can put Texas' abundant renewable energy resources to Use in your home or business, visit our website at **www.InfinitePower.org** or call us at 1-800-531-5441 ext 31796. Ask about our free Teacher Resource Guides and CD available to teachers and home schoolers.

ON THE WORLD WIDE WEB:

RENEWABLE ENERGY POLICY PROJECT & CENTER FOR RENEWABLE ENERGY AND SUSTAINABLE TECHNOLOGY (CREST)
777 North Capitol Street, NE. #805
Washington, D.C. 20002
(202) 289-5370
www.repp.org/

U.S. Department of Agriculture. Center conducting research mentioned. Located 12 miles west of Amarillo, Texas, site is available for tours **www.cprl.ars.usda.gov/**

Environmental and Energy Study Institute - Bioenergy
www.eesi.org/programs/agriculture/Biofuels.htm

Renewable Energy Roundup and Sustainability Fair. An annual event in Texas that provides renewable energy booths, seminars and workshops.
www.RenewableEnergyRoundup.com

Texas Renewable Energy Resource Assessment, Virtus Energy Research Associates (VERA), 1995
www.seco.cpa.state.tx.us/re_links.htm

POSTER:
Our Energy Sources Are Outstanding in the Field. VERA, 1997. Available from the State Conservation Office at (800) 531-5441 ext 31796 or on the web at **www.infnitepower.org**

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InfinitePower.org

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